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ABSTRACT

Paralinguistic and kinesic expression begin at birth and are essential to the development of language. Rhythm, for example, a suprasegmental event, appears to be present at birth or prior to birth. The relationship of physiology to communication is evident in the observations of extra-linguistic aspects of communication, such as movement, the use of the body in space, intense sound, and voice fluctuations. Discoveries regarding the relationship between the brain and language should lead to inquiries regarding the brain and nonverbal behavior as well. It is possible that the origin of nonverbal behavior is in the right hemisphere of the brain, as the origin of language apparently is in the left hemisphere of the brain. Finally, evidence has shown that the cognitive and cognitive-emotive development of an infant begin much earlier than speech development. Attention to these findings should lead to a new approach to the study of the acquisition of language. (Author/AM)

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DEVELOPMENT OF PARALINGUISTIC AND KINESIC EXPRESSION OF ROLES

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An infant's first communicative and cognitive experiences are expressed nonverbally.[1] Infant vocalizations and infant motor activity are precursors of language. Some vocalizations eventually result in language sounds; some result in paralinguistic phenomena. Motor activity results in kinesic expression, among other things.

The development of suprasegmentals (intonational features) appears to start at birth, if not before--if we consider rhythm. For example, the cry can be described in terms of pitch range, intensity, timing, intervals and rhythm, all elements of adult intonation patterns in every language. Vocalizations and motor activity are intimately integrated, and in correlation with each other, though only recently they have been studied from the point of view that they are inseparable.

The development of nonverbal behavior (paralanguage and kinesics) is crucial in the acquisition of language; there is evidence that disruptions of nonverbal behaviors may result in disruptions of acquisition of language. Many scholars have noted the close relationship of body language to the development of speech. Bullowa's studies corroborate this relationship (1970, p. 198).

Rhythm is a basic element of life and behavior, and with the advent of technology scholars are now able to record and film the rhythmic interactions of human beings. Studies that speak to this interactional synchrony are accruing, providing abundant proof that interactive behaviors and responses have their effect on learning and maturing.

Rhythms may be biologically based, or they may be culturally learned. Knowledge of the circadian rhythms or the biologic clock is a commonplace these days. Lieberman's work on intonation in infant vocalizations is based on the hypothesis that there is an innate physiologic basis in the properties of intonation, and that the "linguistic use of intonation reflects an innately determined and highly organized system. . . " (Lieberman, 1968, p. 38). Abercrombie (1967, p. 36) believes that rhythm in language is one of the most fundamental properties, and cites a study of a type of aphasis "in which brain damage has caused every feature of the production of speech to be lost except the pulse systems of the pulmonic air-stream mechanism, as if these were the most resistant to damage to the speech-centres of the brain." (Italics mine, MRK)

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It is thought that learned rhythms begin in utero. Brazelton, et al., (1975, p. 148) suggest that "pathways may be set up in intrauterine life, ready to be entrained, especially by the mother, immediately after birth." They go on to hypothesize that the "messages which are communicated to the infant via the mother's face and movement seem to be at the root of their communication." Condon and his colleagues have been writing on interactional synchrony for over a decade. Their microanalysis of sound films reveal "a complex interaction system in which the organization of the neonate's motor behavior is entrained by and synchronized with the organized speech behavior of adults in his environment." (1974, p. 101). This sociobiological entrainment is basic to communicating. Brazelton, et al., speak of the mother-infant interaction as a regulated homeostatic system. This system involves the achievement of affective synchrony, the substitutability of behaviors within a phase, and the cyclic rhythms. In their observations, they notated vocalizations of both mother and infant, direction of gaze, head position, body position, facial expression, blinks, amount of movement, and specific handling of the infant. These nonverbal behaviors indicated phases in the dyad which moved through: initiation, mutual orientation, greeting, play-dialogue, and disengagement. They found the interactants regulating their behavior in response to each other in a defineable homeostatic system. Rosenfeld has also studied mother-infant interaction. His studies are concerned with a time-series analysis, or the temporal association between infant and mother behaviors. He recorded cooing and fussing, and four variables of the mother: neutral voice, soothing voice, animated voice, and unusual voice (such as whistling and clicking). He has diagrammed the correlations of these interacting behaviors.

The relationship of physiology to communication is immediately evident when one observes extra-linguistic aspects of communication. A surprising number of physiological acts function as communicative devices, or at least contribute to communication. Though linguists do not record such acts as coughing, clearing the throat, or yawning in syntactic analysis, no one could doubt that these physiological acts often occur in human interactions. More subtle relationships having to do with perception of movement, the use of the body in space, the affect of intense sounds, the diurnal fluctuation of the voice, and many others, are more difficult to recognize in correlation with linguistic patterns. I feel strongly that future studies will reveal their importance in human communication.

Dominating all other functions and organs in physiology is the brain which guides human behavior as well as physiology. Attention has been given recently to the relationships of language and the brain. I suggest that attention also be given to the relationship between the brain and nonverbal expressions of human behavior. It is recognized nowadays that nonverbal behavior/communication gives the overriding meaning to the language of the interaction between human beings. Both kinds of behavior are governed by a node in the brain, where thoughts are processed and where many physiological functions are guided.

Gross anatomy of the brain shows two hemispheres--the right and the left. Recent studies indicate that there are small but consistent anatomical differences between these hemispheres, especially locations near Wernicke's area (Geschwind, 1970, p. 944, for example). The right and left hemispheres are asymmetrical, at least in that speech-attributed area. Though this fact is widely accepted, it is by no means clear what the distribution of "duties" is for the right and left hemispheres, nor whether it is mutually exclusive. Over a century ago Broca popularized among neurologists the relationship of the left hemisphere and language. This premise has been widely accepted and has led to further declarations that the left hemisphere is the logical, intelligent, and analytic side of the brain which controls rational thinking. The left side is often referred to as the dominant or the major hemisphere. The right hemisphere is said to be minor and "primitive"--the one from which originate the emotional, intuitive and artistic responses in the human being. Labeling has even gone to silly extremes, such as calling the dominant side "male" and the emotional right side the "female".

It might be seen that the nominal dichotomy of the functioning of the brain is the origin of the apparent dichotomy of verbal and nonverbal behavior. Could it be that the left hemisphere guides language (verbal) and the right hemisphere guides nonverbal acts? A review of the literature on language and the brain gives many examples that lead to this idea. If the extent and importance of nonverbal behavior is recognized, it might subsequently be shown that the "dominant" side is not the left side.

The duties of the left hemisphere are said to specialize in the following: cognitive and propositional language; sounds made by the speech apparatus (Kimura, p. 76); some types of movement of the hand (Kimura, p. 76); speech played backwards, foreign languages, and nonsense syllables (Kimura, P. 71); consonnants (Shankweiler); verbs (Gazzaniga, pp. 117-121). Kimura (p. 76) makes other observations about gestures and their relationship to speech. She notes that the manual activity during nonspeech events is different in kind.

The duties of the right hemisphere seem more numerous and varied and are difficult to delimit. The right hemisphere, Kimura says, plays a dominant role in the human being's perception of the environment. This side processes melodies, timbre and tonal properties, "emotional tone" of sentences (Gazzaniga, p. 104; Kimura, p. 71; Van Lancker and Fromkin). The right side also is said to describe colors and objects (Gazzaniga, p. 65). It processes visual tasks, such as spatial relationships and depth perception (Gazzaniga, p. 65; Kimura, pp. 72-76); emotional behavior, such as humor, displeasure, profanity (Gazzaniga, pp. 105, 117); environmental sounds and sonar signals (Van Lancker and Fromkin, who review other research); nonlanguage vocalizations (Van Lancker and Fromkin); coughing, laughing, crying (Kimura, p. 71);

tactual behavior (Gazzaniga, pp. 25 ff., and passim; Kimura, p. 76); olfactory (Gazzaniga, p. 106); abstract notions, ideation, mental concentration, and high-order mental capacities (Gazzaniga, pp. 125, 128). The right side qualifies statements which are made by the left, by such modifiers as "if, and, but, however" (Gazzaniga, p. 142; Geschwind, p. 942). The right side recognizes faces and tells the face to frown, or to shake the head (Gazzaniga, pp. 104, 107, 121). It also deals with the negative/affirmative concept (Gazzaniga, p. 130; Gazzaniga and Hillyard, pp. 273-274). This should be of interest to linguists who have recently analyzed these concepts in a "pre-sentence" construct. With regard to acquisition of language and the negative/affirmative concept, is there a relationship between the brain development and children who go through the "No" stage, (Gazzaniga, pp. 129-131)? The right side specializes in concrete nouns (Gazzaniga, pp. 120, 129). As far as gestures are concerned, Charlotte Wolff (1945, pp. 198 ff.) noted a preference for the left hand in expressive movement. She felt that the left hand, under the control of the right hemisphere, has a closer link with emotional than voluntary impulses. (See this reference for other comments on the right-left problem.)

Linguistic studies have been done at UCLA recently on Genie, the deprived and isolated girl whose case came to light when she was thirteen years old. Because of her deprivation she resembles split-brain patients as well as left hemispherectomies. Since she has passed the critical stages of maturation, her language is not normal. Nevertheless, Genie performs surprisingly well on abilities normally localized in the right hemisphere. (Curtiss, et al., p. 6). For the most part she performs well on "appositional" tests. They say, "Her performance on some of these tests is simply sensational." On the Mooney Faces Test, which involves gestalt facial recognition, she scored far above the responses of a normal child. As far as they could discover, it was the greatest performance reported on this test for child or adult subjects. They conclude that Genie is proficient in at least some duties of the right hemisphere that have to do with spatial, configuration, appositional, and nonverbal abilities.

The relationship between the right and left hemispheres is not clearly understood yet, in spite of all the impressive research and publications. There are difficulties in testing and some of the experiments seem even more ingenious than the brain itself. For instance, the brain manages to compensate (Geschwind, p. 942), and the behavioral strategies, cross-cueing, interlocking, and cooperation between the right and the left can only remind one that the human brain belongs to an "endlessly clever primate" (Gazzaniga, p. 126). In reviewing the studies, one also becomes aware that the term "nonverbal" is sometimes used in different ways than I am using it here, and we are not always talking about the same behaviors. At times the experiments are inadequate

because they record only the verbal response of the subject, though we know that other interactions take place--as eye movement, facial expression, body movement--which add to the meaning of the response.

Nevertheless, there is enough anecdotal information to hypothesize that the verbal and nonverbal systems have different origins in the brain. For one thing, the consciousness of control of these systems is different. Language is voluntary and conscious while nonverbal behavior is usually out-of-awareness (except, of course, when it is brought into awareness). For another thing, people do not react the same to sounds which are in the sound system of language as to sounds which they use in the paralinguistic system. A teacher in Germany once told me of the difficulty experienced by his students (from another dialect area) in pronouncing a "z" even though they used the sound freely to accompany a certain gesture. English speakers use at least two "click" sounds in their paralinguistic systems, but find it difficult to use these sounds in a language such as Zulu, where they occur in the language system. Also, there is a "perceptual" difference between singing and talking. While some people cannot carry a tune, they have no problem with pitch in intonation. There are differences between the singing and speaking behavior of aphasic patients (Geschwind, 1970, pp. 940-941), and people who stutter. For classifications of right and left behavior, we should again consider linguistic structures that show classes of words which reflect nonverbal categories, such as sensory verbs, and verbs which indicate paralinguistic activity, such as shout, holler, scream, yell, bellow, whisper, shriek, wail, growl, grunt, mumble, moan, howl, mutter (Zwicky, and Ross). Compare Gazzaniga's discussion of "smile, laugh, nod, frown" (p. 121).

There are other curiosities which must be brought to light in discussions of specialities of the two sides of the brain. For example, male and female responses. Kimura notes that males tend to have a greater left-visual-field superiority for dot location and dot enumeration than do females, and that females tend to have more verbal fluency than males (Kimura p. 78). Someone has conjectured that females do somewhat better than males in music performance. In prelinguistic behavior one notes that infants coordinate seeing and reaching. Gazzaniga (p. 132) says that there is a clear link between eye and hand, and I am reminded of the remark by Juana Ines de la Cruz: "I hold in my hands my two eyes, and see only what I touch." The matter of tactile interaction between humans is of concern in that some scholars have suggested that the act of touching and being touched is essential to the development of the brain, as well as to other physiological maturation.

For further references on studies of the brain, see Gaszzaniga; for other references on Kimura's important research, see Shankweiler.

The cognitive and cognitive-emotive development of an infant begin much earlier than speech development. These features are expressed in vocalizations and kinesic behavior. The infant relates to categories and concepts in nonverbal ways. The kinds of things which later are articulated in language to give meaning are being developed before speech begins. For example, infants begin to distinguish between human and nonhuman (animate and inanimate categories in morphological or syntactical structures). Brazelton, et al, (p. 144-145), observe the responses of infants to objects and humans, and indicate that the infant is able to differentiate inanimate and animate events as young as two or three weeks of age. Infants gain control over: affirmation/negation; deictic processes; demand/request/command; alternatives (if, and, or); cause-effect (pushing, dropping, hitting). The infant relates to imaginative and pretend concepts by pretending to pick things out of the air, or dressing up in Mommy's purse and shoes (legendary and fable linguistic categories). The infant is defining categories by inserting or removing certain objects from the toy box, a purse, clothes hamper, wastepaper basket, dishwasher, and drawers. Infants understand rejection and denial, as well as various question types: Who? Where? What?

Infants make up vocabulary items to cover categories which are meaningful to them. One infant I observed said /ˉ šīšī_/ every time she heard a lawn mower, vacuum cleaner, automobile, or any motor than sounded similar. Infants also use syntactic structures of more than one element before speech develops. One infant I know used a three-constituent construction at one year of age. It was composed of recognizable syllables and a three-element intonation pattern, which could be recorded something like the following:

/ˉda-da-da iiiiii da-da-da_/. It occurred while the family was out riding and a vehicle with a siren shrieking crossed their path suddenly. Complete with uplifted facial expression and pointing gesture toward the sound, it could be translated something like, "Mommy, a siren went by'" or "Listen! The siren made a noise!" Infants are often heard to make two-constituent constructions, such as /ˉda-da-da Ummmmmm_/, which might be translated "These (are) good"--an equational construction.

Infants use conversational styles, "talk" in whole paragraphs, and "tell" stories before they develop speech. These are expressed with nonsense (to the adult) syllables, using intonation patterns with breath groups and rising-falling pitches as are heard in dialogue and paragraph structure. Appropriate gestures and movement complete the "conversation", which may take place with a toy phone, with dolls, or with other small children. One infant I observed folded her arms at the end of the "conversation" just as her daddy did.

It seems that it would be profitable to investigate infant communication in much the same way that linguists record an unwritten language in a monolingual approach--when there is no common language between the native language and the linguist. One would discover that before speech the infant uses communicative devices in a systematic and meaningful way.

In summary, it can be seen that paralinguistic and kinesic expression begin at birth and are essential to the development of language. The relationship of physiology to communication is evident in the observations of extra-linguistic aspects of communication. It is possible that the origin of nonverbal behavior is in the right hemisphere of the brain, even as the origin of language apparently is in the left hemisphere of the brain. Attention to these findings should lead to a new approach to the study of the acquisition of language.

FOOTNOTES

[1]Much of the material presented here is further elaborated on with added documentation in my two recent books on nonverbal behavior, Key, 1975; and Key, in press.

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